This Page Is Inserted by IFW Operations
and is not a part of the Official Record

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

IMAGES ARE BEST AVAILABLE COPY.

As rescanning documents *will not* correct images, please do not report the images to the Image Problem Mailbox.

WE CLAIM:

1. A photonic device comprising at least one integral waveguide formed from a REDGIVN (rare earth doped group iv nanocrystal) material.

2. A photonic device according to claim 1 wherein the wave guide has a planar structure.

3. A photonic device according to claim 2 comprising a substrate and/or bottom cladding, a layer containing the REDGIVN material, and a lateral containment element adapted to laterally confine light to a region within the layer containing the REDGIVN material where the at least one wave guide is to be defined.

4. A photonic device according to claim 1 wherein the at least one wave guide is arranged to form a Mach Zehnder interferometer.

5. A photonic device according to claim 1 wherein the at least one wave guide is arranged to form an optical splitter.

6. A photonic device according to claim 1 further comprising:

a pump source adapted to activate the nanocrystals in the wave guide which in turn activate the rare earth element in the REDGIVN.

7. A photonic device according to claim 6 adapted to perform an amplification function upon an input optical signal to produce an amplified output optical signal.

8. A photonic device according to claim 7 comprising a substrate and/or bottom cladding, a layer containing the REDGIVN material, and a lateral containment element adapted to

laterally confine light to a region within the layer containing the REDGIVN material where the at least one wave guide is to be defined.

9. A photonic device according to claim 7 wherein the pump source comprises an optical pump source.

10. A photonic device according to claim 9 wherein the optical pump source comprises a broadband optical pump source.

11. A photonic device according to claim 10 wherein the broadband optical pump source is arranged to transversely pump light into the at least one wave guide.

12. A photonic device according to claim 11 comprising a substrate and/or bottom cladding, a layer containing the REDGIVN material, and a lateral containment element adapted to laterally confine light to a region within the layer containing the REDGIVN material where the at least one wave guide, wherein the lateral containment element comprises an etched ribbed channel of spin on glass.

13. A photonic device according to claim 10 wherein the broadband source comprises at least one broadband LED (light emitting diode).

14. A photonic device according to claim 13 wherein the at least one broadband LED comprises a plurality of broadband LEDs arranged to collectively transversely pump the at least one wave guide.

15. A photonic device according to claim 13 further comprising coupling optics between each LED and the wave guide to focus light from the LED into the wave guide.

16. A photonic device according to 15 further comprising a reflection chamber surrounding the device to contain light within the device.

17. A photonic device according to claim 1 comprising an optical signal receiving surface through which light is received into the wave guide.

18. A photonic device according to claim 14 wherein said at least one wave guide comprises a plurality of wave guides, and wherein each LED pumps the plurality of wave guides.

19. A photonic device according to claim 1 further comprising an optical signal conveying surface through which the output signal is coupled to another optical element either directly or through free space optics.

20. A photonic device according to claim 1 wherein the wave guide is a plated wave guide formed in an opening in a resist prior to the resist being removed.

21. A photonic device according to claim 9 wherein optical pump source comprises an LED of a single or multiple wavelengths that cover a particular absorption band of the type IV semiconductor nanocrystals.

22. A photonic device according to claim 9 further comprising an optical taper used to transmit the combined light signal away from the broadband optical source, the taper using Total Internal Reflection (TIR) to direct the broadband source to the wave guide.

23. A photonic device according to claim 22 wherein the optical taper is an optical prism.

24. A photonic device according to claim 9 further comprising:

at least one Holographic Optical Element (HOE) located after (downstream from) the optical pump source.

25. A photonic device comprising:

an amplification medium comprising REDGINV;

a plurality of light sources;

a combiner adapted to combine light from the plurality of light sources to produce a broadband optical pump source which pumps light into the amplification medium.

26. A photonic device according to claim 25 wherein the plurality of light sources comprise a plurality of LEDs.

27. A photonic device according to claim 26 wherein the combiner comprises an lens, wherein there is self-alignment of the operational wavelengths of the LED sources to the acceptance angle characteristics of the input lens.

28. A photonic device according to claim 27 wherein the lens is a Plano-convex aspherical cylindrical design that has a small F# and short focal length to re-image the LED source and or sources to a planar output plane where the amplifying median is located.

29. A photonic device according to claim 25 wherein the combiner comprises a single or multiple micro-reflectors to efficiently the light signals into the broadband optical pump source.

30. A method of manufacturing a planar type optical amplifier comprising:

forming a bar-shaped core on a plane substrate;

forming a groove to the core which extends to the longitudinal direction thereof;

filling the groove with a filler containing REDGIVN; and

solidifying the filler.

31. A method of preparing a photonic device with an integral guide formed from a type IV semiconductor nanocrystal doped with rare earth ion material.

32. A method of preparing a REDGIVN wave guide on a photonic device comprising the steps of applying a resist, transferring an image to the resist, and developing the image.

33. A method of preparing a plated REDGIVN guide on a photonic device comprising the steps of applying a resist, transferring an image to the resist, developing the image, plating the resist, and removing the resist.